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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/727,222

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Jae-Bon Koo

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03/16/2005

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EXAMINER

LANDAU, MATTHEW C

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 03/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

4A

Office Action Summary	Application No. 10/727,222	Applicant(s) KOO ET AL.	
	Examiner Matthew Landau	Art Unit 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-27 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 December 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>12/4/2003</u> . | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION***Drawings***

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the “the first angle is larger than the second angle” (claim 17) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

The disclosure is objected to because of the following informalities: Page 1, lines 4 and 5 of the instant application state that the Korean priority document was filed on May 1, 2002. The actual filing date of Korean Patent Application 2003-27990 is May 1, 2003.

Appropriate correction is required.

Claim Objections

Claims 10, 12, 16, and 24 are objected to because of the following informalities:

Regarding claim 10, the limitation “the channel area the driving thin film transistor” should be changed to read, “the channel area of the driving thin film transistor”.

Regarding claim 12, the limitation “current flow in that channel area” should be changed to read, “current flow in the [[that]] channel area”.

Regarding claim 16, the limitation “the switching thin film transistor a first angle” should be changed to read, “the switching thin film transistor has a first angle” (or something similar).

Regarding claim 24, the limitation “in a range of about 45° to about 45°” should be changed to read, “in a range of about -45° [[45°]] to about 45°”.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3 are rejected under 35 U.S.C. 102(a) as being anticipated by Yamazaki et al.

(US PGPub 2003/0062845, hereinafter Yamazaki).

Regarding claim 1, Figures 1, 2, and 5 of Yamazaki disclose a light emitting device 121; a switching thin film transistor 101 including a semiconductor active layer 110 having at least a channel area for transferring a data signal to the light emitting device; and a driving thin film transistor 102b including a semiconductor active layer 111 having at least a channel area for driving the light emitting device so that a predetermined current flows through the light emitting device according to the data signal, wherein with respect to a direction of any grain boundary, the channel area of the switching transistor is situated along a first direction and the channel area of the driving transistor is situated along a second direction, and wherein a direction of current flow in the channel area of the switching thin film transistor is different from a direction of current flow in the channel area of the driving thin film transistor with respect to any grain boundary. Figures 15A to 15E of Yamazaki show examples of devices using the display disclosed by Yamazaki. All of these devices have flat panel displays. It is inherent that the channel of the switching transistor 101 has a grain boundary. Figures 1 and 5 of Yamazaki show that the channel direction (i.e., direction of current flow) in the switching transistor 101 is perpendicular to the channel direction (direction of current flow) in the driving transistor 102b. Therefore, it can be considered the channel area of the switching transistor is situated along a

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first direction with respect to the grain boundary and the channel area of the driving transistor is situated along a second direction with respect to the grain boundary.

Regarding claims 2 and 3, Figure 5 of Yamazaki disclose the crystal growth direction is parallel to the channel of the switching transistor 101 and perpendicular to the channel of the driving transistor 102b, and that the current mobility of the switching transistor will be greater than that of the driving transistor (page 4, paragraph [0048] and Table 1).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki in view of Komiya et al. (US Pat. 6,456,013, hereinafter Komiya).

Regarding claim 4, Yamazaki discloses the active layer is formed from polycrystalline semiconductor material (page 4, paragraph [0052]), but does not specifically disclose using polycrystalline silicon. Figure 3 of Komiya discloses a display device using a polycrystalline silicon active layer 13 (col. 5, lines 40-45). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Yamazaki by using polycrystalline silicon for the purpose of selecting an inexpensive semiconductor material that has high carrier mobility.

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Regarding claims 5 and 18, Yamazaki discloses the polycrystalline semiconductor (silicon) has anisotropic crystal grains (page 4, paragraph [0053]).

Regarding claims 6 and 19, a further difference between Yamazaki and the claimed invention is a crystal grain has a first length which is at least 1.5 times longer than a second length in direction which is substantially perpendicular to a direction of the first length. It is inherent that crystal grains in the active layers (110 and 111) of Yamazaki have first and second lengths, and that the first length (in a direction parallel with crystal growth direction shown in Figure 5) is longer than the second length (in a direction perpendicular to the crystal growth direction). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of by having the first length be at least 1.5 times longer than the second length, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding claims 7 and 8, it is inherent that the grains in the active layers (110 and 111) of Yamazaki have longer grain boundaries that run parallel to the crystal growth direction (shown in Figure 5). Therefore, Figure 5 of Yamazaki disclose semiconductor (silicon) grains including longer grain boundaries situated along a direction which makes a first angle (approximately 0 degrees) with a direction of current flow in the channel area of the switching transistor 101 and a second angle (approximately 90 degrees) with a direction of current flow in the channel area of the driving transistor 102b. Note that the second angle is larger than the first angle.

Regarding claims 9 and 21, when using the laser beam solidification method disclosed by Yamazaki (paragraphs [0052]-[0059]), it is inherent that the polycrystalline semiconductor will have “primary” grain boundaries that are perpendicular to the direction of the “side” grain boundaries of the anisotropic grains, and that the average interval between the side grain boundaries is shorter than the average interval between adjacent primary grain boundaries.

Regarding claims 10, 11, 13, 15, 22, 23, 25, and 27, since the primary grain boundaries are perpendicular to the side grain boundaries (which extend in a direction corresponding to the length direction of the grains, which corresponds to the direction of crystal growth shown in Figure 5), the direction of current flow in the channel area of the switching thin film transistor 101 makes a first angle (90 degrees) with a direction along which the primary grain boundaries are situated and the direction of current flow in the channel area of the driving thin film transistor makes a second angle (0 degrees) with the direction along which the primary grain boundaries are situated.

Regarding claims 12, 14, 24, and 26, since the side grain boundaries extend in a direction corresponding to the length direction of the grains, which corresponds to the direction of crystal growth shown in Figure 5 of Yamazaki, they form an angle of approximately 0 degrees with the direction of current flow in the channel area of the switching thin film transistor, and they form an angle of approximately 90 degrees with the direction of current flow in the channel area of the driving thin film transistor.

Regarding claims 16 and 20, Figures 1, 2, and 5 of Yamazaki disclose a light emitting device 121; a switching thin film transistor 101 which is formed using a polycrystalline semiconductor (page 4, paragraph [0052]) and includes a semiconductor layer 110 having a

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channel area for transferring a data signal to the light emitting device; and a driving thin film transistor 102b which is formed using a polycrystalline semiconductor and includes a semiconductor layer 111 having a channel area for driving the light emitting device so that a predetermined amount of current flows through the light emitting device, wherein the channel area of the switching thin film transistor has a first angle (approximately 0 degrees) between a length direction of polycrystalline semiconductor grains and a direction of current flow in the channel area and the channel area of the driving thin film transistor has a second angle (approximately 90 degrees) between a length direction of polycrystalline grains and a direction of current flow in the channel area. Note that it is inherent that the length direction of the grains corresponds to the direction of crystal growth shown in Figure 5 of Yamazaki. The difference between Yamazaki and the claimed invention is using polycrystalline silicon. Figure 3 of Komiya discloses a display device using a polycrystalline silicon active layer 13 (col. 5, lines 40-45). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Yamazaki by using polycrystalline silicon for the purpose of selecting an inexpensive semiconductor material that has high carrier mobility.

Regarding claim 17, the second angle (indicated above as being approximately 90 degrees) could also be considered -90 degrees. This would mean that the first angle (indicated above as being 0 degrees) is larger than the second angle.

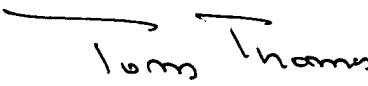
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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew C. Landau whose telephone number is (571) 272-1731.

The examiner can normally be reached from 8:30 AM - 5:30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.


TOM THOMAS
SUPERVISORY PATENT EXAMINER

Matthew C. Landau

Examiner

March 10, 2005